

Title: Evaluation of occupational therapy workshops to prevent work-related injuries or illnesses among vocational students

Article accepted by Journal of Occupational Therapy, Schools and Early Intervention

Authors : Lecours, Alexandra* ^{1, 2}; Therriault, Pierre-Yves^{1, 2, 3}

1. Département d'ergothérapie, Université du Québec à Trois-Rivières
2. Laboratoire de recherche en ergologie, Université du Québec à Trois-Rivières
4. Center for Research and Expertise in Social Gerontology (CREGÉS)

*Corresponding author : Alexandra Lecours : Alexandra.Lecours@uqtr.ca, 819 376-5011

Address :

Département d'ergothérapie
Université du Québec à Trois-Rivières
3351, boul. des Forges, C.P. 500,
Trois-Rivières (Québec)
Canada
G9A 5H7

Conflict of interests

The authors declare that there is no conflict of interest.

Funding

Fonds de Recherche du Québec-Société et Culture [Doctoral scholarship to first author, grant # 197569], Institut de Recherche Robert-Sauvé en Santé et en Sécurité du Travail [Doctoral scholarship to first author], Fondation canadienne d'ergothérapie [Doctoral scholarship to first author].

Ethics

Participants took part freely and voluntarily in the study; no financial incentive was offered. This project received the approval of the Research Ethics Committee with humans of the Université du Québec à Trois-Rivières (CER-14-208-07.02).

Acknowledgments

The authors would like to thank all the participants of the study as well as the members of the Laboratoire de recherche en ergologie de l'Université du Québec à Trois-Rivières for the review of this manuscript.

Other

The Figure 1 included in the manuscript originally comes from a published article (Lecours, A., & Therriault, P. (2016). Preventive behavior at work - A concept analysis. *Scand J Occup Ther, On line*(Epub ahead of print), 1-10. <http://dx.doi.org/10.1080/11038128.2016.1242649>). Authorization to use this figure in the submitted manuscript has been asked and will be formally provided if accepted.

Title: Evaluation of occupational therapy workshops to prevent work-related injuries or illnesses among vocational students

Journal : Journal of Occupational Therapy, Schools and Early Intervention

Abstract:

Background. The few studies aiming to evaluate prevention interventions provided by occupational therapists in health at work were conducted in work settings. However, to intervene in primary prevention, developing occupational therapy interventions with students learning a trade is relevant. **Objective.** To evaluate workshops designed and set up by occupational therapists on vocational students' preventive behavior at work. **Method.** A systematic approach was used to design and set up the prevention workshops for students of cooking and hairstyling programs. Evaluation focused on three variables: 1) satisfaction with workshops, 2) apprenticeship, and 3) behavior observed. **Results.** Results were positive on the three variables. Also, students who took part in the workshops showed near 15 % ($p < 0.05$) more preventive behavior than those who received the traditional prevention training only. **Conclusion.** This study supports the effective role of occupational therapists to promote vocational students' preventive behavior at work. The promising results open the door to the arrival of occupational therapists in vocational training centers.

Key words : occupational health and safety; health at work; primary prevention; vocational students

Introduction

With more than 317 000 000 injuries or illnesses occurring on the job each year all over the world (International Labour Organization, 2015), work-related injuries and illnesses are a major public health concern. In fact, around 700 000 workers suffer from an injury every day throughout the planet (Hämäläinen, Takala, & Saarela, 2006). Young workers are particularly at risk of suffering work-related injuries (CSST, 2014; Hämäläinen et al., 2006), because of accumulation of various work constraints (Gervais, Massicotte, & Champoux, 2006; É. Ledoux & Laberge, 2006; Zierold & Anderson, 2006), lack of experience and lack of prevention training (Laberge, Maceachen, & Calvet, 2014; Élise Ledoux et al., 2008; Moreau, Angora, & Michel, 2013; Moscato et al., 2011).

Government, industries and training schools put constant efforts to improve occupational health and safety. Various modalities, such as equipment engineering, management strategies or training are used to reduce the frequency and severity of injuries. In that sense, studies suggest that workers' preventive behavior play an important role in occupational health and safety (Akselsson, Jacobsson, Bötjesson, Ek, & Enander, 2012; Cossette, 2013; Roy, Cadieux, Forter, & Leclerc, 2008; Simard & Marchand, 1994).

To improve preventive behavior of workers, training must begin during vocational studies. Authors suggest first experiments of apprentices, especially those during vocational training, would base their relations with prevention for the rest of their working life (Frigul & Thébaud-Mony, 2010). Training is then important to prepare students to be engaged toward prevention when entering the labor market. International literature discloses that significant gaps are present in the prevention training offered to future workers. It appears the responsibility for the quality of training in prevention is not shared between the different actors of the education system, but are mainly relegated to teachers (C. Chatigny & Desmarais, 2015; Moreau et al., 2013; Passmore, Odnoda, Paine, & Mohamed, 1991; Pisaniello et al., 2013). Teachers face several daily challenges, such as lack of educational resources. For example, the few pedagogical tools available to teach prevention are mostly generic and not specific to the trade taught (C. Chatigny & Desmarais, 2015). Most of vocational teachers are professionals in their field who decided to turn to teaching to pass on their knowledge or to live new challenges, sometimes after a long career (Balleux, 2006). Although they are skilled in their occupation, they may not be trained to teach prevention (Lecours & Therriault, 2017b). Some government initiatives offer guidance tracks, but no standard or policy standardize prevention teaching in vocational training centers. This leads to a large variability about training resources, teaching methods and course contents between study programs (C. Chatigny & Desmarais, 2015; Pisaniello et al., 2013). This situation creates inequality about training received by students, thus making some at higher risk of injury than others.

Occupational therapists are professionals of choice to help vocational teachers in their prevention training tasks with students. Occupational therapists play an important role in health at work, especially in assessment and rehabilitation of injured workers (Bade & Eckert, 2008; Deen, Gibson, & Strong, 2002; Jundt & King, 1999). However, with a holistic approach and a unique expertise in activity analysis, adaptation of environment, teaching of healthy behavior and group education, occupational therapists are providers of choice to offer health promotion and primary prevention interventions (Adam, Gibson, Lyle, & Strong, 2010; Bade & Eckert, 2008; COT, 2008; Scaffa, Van Slyke, & Brownson, 2008). The specificity of occupational therapists in enabling through occupations allow to promote health and well-being and to prevent populations from disease or illness (Tucker, Vanderloo, Irwin, Mandich, & Bossers, 2014). In that way, the Canadian Association of Occupational Therapists published a position statement about occupational therapy in health at work in 2015 (CAOT, 2015). This paper recommends developing a more active implication of occupational therapists in early interventions, such as in promotion of healthy and preventive behavior at work. In this sense, this study is about the evaluation of an occupational therapy intervention in primary prevention of work-related injuries or illnesses among vocational students.

Context of vocational training

In the Canadian province of Quebec, training for a skilled or semi-skilled occupation is primarily offered in one of the 195 vocational training centres, which are specialized schools distinct from high schools. The training programs are offered on a full-time basis and the duration of study is relatively short, ranging from 600 to 1,800 hours. The education is entirely oriented toward learning the trade. There is no general education. The curriculum is divided into multiple training modules developing specific skills. The duration of these modules varies between 15 and 135 hours of training. For the 2013–2014 academic year, 129 348 students were registered in one of the programs (Gouvernement du Québec, 2015). These students are composed of minors coming from general high schools, but also from adults who have experienced periods of employment, studies, inactivity or immigration (Berbaoui, 2015; Chatigny, Nadon-Vézina, Riel, Couture, & Hasteley, 2012; C. Chatigny & Desmarais, 2015). Pupils aged 24 and under represent 55% of the population, while those aged 30 and over account for 30% of the clientele in vocational training centres (Gouvernement du Québec, 2010). Very young students (less than 20 years old) would represent only 17% of the clientele (MELS & MESRST, 2012). Over 60% of young students (24 years old or younger) have a high school diploma upon entering vocational training, while only 40% of older students (25 years and older) have earned this diploma. These pupils live in majority (60%) with their parents and most of them (70%)

work part-time outside their studies (Berbaoui, 2015). The clientele of vocational training centres comprises men at 56% (Gouvernement du Québec, 2010).

Theoretical background

Even if work is one of the targets of interest of occupational therapists, few studies have been conducted to define the role of occupational therapists in promoting preventive behavior at work. Also, interventions of occupational therapists in primary prevention of work-related injuries or illnesses have been little described or assessed. To develop the role of occupational therapists in this field, a recent concept analysis defined preventive behavior at work (Lecours & Therriault, 2017a). Preventive behavior at work consists of observable and measurable actions that workers can concretely take to protect their own health and safety or that of their colleagues, contributing to the overall health of the organization. Authors suggest that occupational therapists have the unique expertise to help develop the five attributes of the concept, which are: 1) compliance with rules and procedures (e.g. wearing individual protective equipment or performing regulated activities), 2) proactivity, participation, involvement and initiatives related to prevention (e.g. attending safety oriented training or taking part of health and safety committees) , 3) maintenance of physical environment (e.g. workstation's cleaning or preventive maintenance of work equipment), 4) concern for social environment (e.g. asking for help or communicating with others about health and safety) and 5) reflexivity and analysis of work situations (e.g. health and safety risks identification and appropriate knowledge mobilization). Figure 1 exposes the attributes of the concept. It also presents the antecedents that have to be developed before the expression of preventive behavior, as well as the consequences that can occur after the onset of preventive behavior.

Insert figure 1 here

To our knowledge, the few studies conducted to evaluate prevention interventions that occupational therapists provide in health at work took place in work settings (e.g. Fisher et al., 2009; McCluskey et al., 2005). To intervene in primary prevention, developing occupational therapy interventions with students learning a trade is relevant. It also has social significance because it acts before the exposure to occupational hazards, enabling future workers to have early strategies to preserve their health.

Occupational therapy strategies focusing on education, skills development or group interventions are effective in the general field of health at work (e.g. Snodgrass, 2011), as well as in elementary school settings (e.g. Donica et al., 2013). It is then possible to hypothesize that an intervention, in the form of

workshops, supporting the development of vocational students' preventive behavior at work, will also be effective.

Aim

The aim of this study was to evaluate prevention workshops designed and set up by occupational therapists on vocational students' preventive behavior at work.

Method

Design

A quantitative research design, including descriptive and quasi-experimental approaches was used to conduct the study.

Participants

Participants were students from two vocational study programs, namely cooking and hairstyling, from a vocational training center in Quebec, Canada. These programs were selected from a collaboration between the research team and the school principal based on the different risks to health and safety related to the trade (e.g. occupational illnesses and musculoskeletal disorders or work-related injuries). Two groups of each study program took part; one experimental group who attended to workshops as well as to the traditional prevention teaching; and one control group who received the traditional prevention teaching only. Since group composition is determined by the school and remains the same throughout the curriculum, randomization was not possible. Participants were all French speaking.

Variables

Independent variables

Workshops

Two series of three workshops of 60 minutes each have been developed, one for the cooking program and the other for the hairstyling program. To foster interprofessional collaboration, workshops were designed jointly by research team members, who were all occupational therapists in health at work, and teachers in each program. The ten-step process of Kirkparick and Kirkpatrick (2007) presented in Table 1 was followed to design workshops. This systematic process was chosen for its quality recognized in workers' training and for its simplicity (Dunberry & Péchard, 2007), making it easier to apply in the vocational

training context. Workshops aimed to develop attributes of preventive behavior at work among students, while being designed for the specific reality of the two trades taught.

Insert table 1 here

First, semi-structured individual interviews with teachers and group interviews with students were conducted to understand needs, to check their adequacy with competencies to acquire and to formalize the content of the workshops. This first step also ensured a client-centered approach, an important value for occupational therapists (Drolet & Désormeaux-Moreau, 2015).

Structured observation sessions in workshops, with exchanges with students and teachers in action, have made it possible to analyze work and to identify work-related risks to health and safety. This step ensured that workshops were specific to trade.

Finally, effectiveness factors recommended in scientific literature towards learning methods and strategies to favor in vocational training or in workers' training were considered in workshops' design. First, literature in vocational training suggests that "one learns by working" or that "activity is accompanied by an apprenticeship" (Billet, 2001; Pastré, Mayen, & Vergnaud, 2006). Thus, learning through an experience that makes sense for the student (Langevin, 2009) seems to be an element to consider when designing workshops. Modalities such as contextualized teaching, hands-on workshops and role-playing are interesting to include. However, Guillemette and Gauthier (2006), in an analysis of scientific literature in pedagogy, suggested that experience alone does not necessarily lead to students' learning. Indeed, it appears that a reflection must go with the experience for an apprenticeship to take place. In this sense, modalities such as self-evaluation or group discussions can be interesting to integrate into workshops.

In the specific field of workers' training, Burke et al. (2006) conducted a broad meta-analysis about the effectiveness of prevention training with 95 quasi-experimental studies. Authors inferred that a training requiring a high involvement from the students' part (e.g., hands-on workshops including two-way dialogue between the trainer and the learner) is the most effective in acquiring knowledge, changing behavior and on reducing work-related injuries. To ensure a participatory teaching that stimulates students' involvement, modalities such as identification of risks in workshops, resolution of complex situations or guided practice are preferred. Table 2 exposes a description of principal workshops' characteristics designed for cooking and hairstyling programs.

Insert table 2 here

Students of the experimental group took part in workshops in the teaching module related to the prevention of work-related injuries or illnesses, which starts in the first month of the vocational studies. An experimented occupational therapist in health at work and a teacher of the study program animated the workshops. Workshops were held once a week. Students' participation in workshops was in addition to the traditional prevention teaching they usually receive.

Traditional prevention teaching

Study programs of cooking and hairstyling both include a 30-hour module dedicated to education about prevention of work-related injuries or illnesses. However, this module is generic and not specific to trade (C. Chatigny & Desmarais, 2015). Notions on the legislation about health and safety are addressed as well as risks to health or safety (Girard, Doyon, Gilbert, Legris, & Laliberté, 2006). Less often, working methods and skills to prevent these risks are taught (Girard et al., 2006). Control group received this training only.

Dependent variables

Evaluation of workshops was done according to principles suggested in the literature (Dunberry & Péchard, 2007; Hamblin, 1974; Kearns & Miller, 1997; Kirkpatrick & Kirkpatrick, 2007; Molenda, Pershing, & Reigeluth, 1996; Phillips, 1997). Three variables were used to evaluate workshops on the development of students' preventive behavior at work. These were 1) satisfaction with workshops; 2) apprenticeship; and 3) behavior observed.

Satisfaction with workshops

The first dependent variable is students' satisfaction with workshops. Satisfaction with teachings received is essential since it acts as an engine for motivation to change behavior among participants (Kirkpatrick & Kirkpatrick, 2007). Satisfaction of learners is also a way to ensure the respect of the client-centered approach in the intervention. A self-administered questionnaire in which the participant points out his agreement on eleven statements about various aspects of workshops was used (Lee & Pershing, 1999; Morgan & Casper, 2000). Items were about satisfaction with objectives, contents, teaching methods, quality of the animation and relevance to trade. Examples of statements were *Workshops' objectives were clear and precise* or *Workshops allowed me to increase my knowledge and skills related to prevention*. Statements were quoted on an ordinal four-point scale ranging from 'strongly disagree' to 'strongly agree'. This questionnaire was developed specifically for this study and a prior pilot study (Lecours, Sauvageau, Contin, & Therriault, submitted). An occupational therapist, two teachers in vocational education as well

as five vocational students checked face validity and content validity. This measure was taken with the experimental group only and was held immediately after the third workshop.

Apprenticeship

Second, apprenticeship was evaluated. As knowledge is an important antecedent for the development of preventive behavior at work (Lecours & Therriault, 2017a), it is important to measure the apprenticeship of students after their participation in workshops. A questionnaire with six short answer questions based on important knowledge to acquire was used. Examples of questions were *Identify one corrective action to reduce the risk factor of repeatability in your job* or *What is preventive behavior at work for you?* A percentage score based on the number of correct answers was obtained. This tool was subjected to the same validation process as the previous. This measure was taken with the experimental group only and was held immediately after the third workshop.

Behavior observed

Finally, an objective measure of preventive behavior was used, as recommended in scientific literature (Kirkpatrick & Kirkpatrick, 2007). This is also in accordance with preventive behavior, which is defined by the recognition of its attributes through the observable actions of workers, or students (Lecours & Therriault, 2017a).

Video recordings of participants in action in their work were made and analyzed using a measurement tool validated in ergonomics, namely the *Grille de comparaison des capacités du travailleur en relation avec les exigences du poste de travail (GACE)* (Therriault, 2006). This systematic observation tool of work behavior was subjected to validation studies (M. Lavoie & Therriault, 2009; Therriault, 2006). Content validity and face validity were verified by a group of experts and inter-rater reliability varies from 'acceptable' to 'almost perfect' according to the different behavior observed (M. Lavoie & Therriault, 2009). The tool allows to structure observation of different behavior (e.g. lifting a load, carry a load, bend neck, keep a position with the upper limb) that students adopt in their work. The scoring method uses a dichotomous scale to classify the observed behavior as adequate (A) or problematic (P) (Guimont, 2013; E. Lavoie, 2008). For this study, an A rating was assigned if the student's behavior presents the integration of preventive behavior attributes required for the situation, while a P rating was assigned to the behavior if the student did not demonstrate the attributes required for the situation. For example, if a hairstyling student using scissors ensures they are sharp (attribute # 3 - maintenance of physical environment), analyses the position of his arms in relation to the client's head (attribute # 5 - reflexivity and analysis of work situations)

to perform adjustments to the chair height allowing him to respect the natural alignment of the body, he will get an A for this behavior. On the contrary, if a cooking student that must move a heavy hot cooking pot does not take the time to evaluate the task, the weight and the distance to be travelled (attribute # 5 - reflexivity and analysis of work situations), or neglects to prevent colleagues of his move with the hot pot (attribute #4 - concern for social environment), he would get a P for this behavior. The analysis of video recordings with the GACE allowed to count the number of adequate and problematic behavior observed and then establish percentages. For each study programs, behavior in three tasks were observed. For hairstyling, participants were observed while they were 1) doing a hair cut, 2) doing a shampoo, and 3) using the hair dryer. For cooking, participants were observed while they were 1) preparing a piece of meat, 2) cutting vegetables and 3) brewin a mixture.

To get a rigorous evaluation of workshops on the development of students' preventive behavior at work, this measure was taken for experimental and control groups. Also, the measure was held twice in each group, namely one measure two weeks after workshop 3 (time 1) and one measure 10 months after workshop 3 (time 2). These two measurement times allow to evaluate workshops at short and long terms, as they refer to the beginning (time 1) and to the end of the vocational studies (time 2). It would have been interesting to take a measure before students' participation to the first workshop, but it was not possible since laboratory work began only after the end of the third workshop.

Analyses of video recordings were conducted by a doctoral candidate who is also an experimented occupational therapist. A proportion of 25% of the recordings were also analyzed by a research assistant to ensure an inter-rater reliability of 85%. In addition, analyzes of video recordings with the observation tool were conducted blindly, meaning that evaluators did not know whether observed sequences referred to the measure at time 1 or at time 2, nor which videos come from experimental or control group.

As this study included several variables and multiple measurement times, figure 2 exposes measurement times of each variable for experimental and control groups.

Insert figure 2 here

Analyses

For demographic variables, as well as for variables of satisfaction with workshops and apprenticeship, simple descriptive statistics were performed, including frequencies, means and standard deviations. A statistical comparison test for independent samples, namely the Mann-Whitney U test (Field & Field, 2013) was used to analyze the variable of behavior observed. This allowed to assess the difference in percentages

of adequate behavior between control and experimental groups, at time 1 and at time 2. Effect sizes were also calculated. Due to the non-normal distributions of this variable, a nonparametric statistical test was chosen (Field & Field, 2013). Statistical analyses were performed with the Statistical Package for the Social Sciences (SPSS) Version 23.0.

Statistical power

For comparison tests with independent samples (Mann-Whitney U test), statistical power reaches 80% for an effect size (r) of 0.38 or more when considering a sample size (n) of 19 by group (n at time 2) and a significance level (p) of 0.05 (Faul, Erdfelder, Buchner, & Lang, 2009). The reference values established by Cohen (1988) suggest that an effect size (r) of 0.1 is small, 0.3 is moderate, 0.5 is large and 0.7 is extra-large. In this sense, according to the study parameters, it will be possible to detect moderate to extra-large effects (Cohen, 1988).

Ethics

Participants freely and voluntarily agreed to take part in the study. No incentive was offered. This project was approved by the Université du Québec à Trois-Rivières' *Comité d'éthique de la recherche avec des êtres humains* [Ethics Committee for Research Involving Human Subjects] (CER-14-208-07.02).

Results

Description of participants

For both cooking and hairstyling programs and for control and experimental groups, all possible participants took part in the study. No one refused. At time 1, 38 participants were in the control group and 36 were in the experimental group. At time 2, 19 participants were in each group; the others have left their study program because they did not want to continue their studies in this trade. Table 3 exposes the principal characteristics of participants and suggests there is no difference between the two groups on all of these characteristics.

Insert table 3 here

Evaluation of workshops

Satisfaction with workshops

The weighted average level of participants' agreement in the experimental group ($n = 32$) on the eleven statements of the questionnaire was 3.4 ± 0.4 , which suits to a rating ranging from 'agree' to 'strongly

agree'. Among all participants in the experimental group, 77.5 % said they were motivated to take part in workshops, while 89 % found their participation in workshops allowed them to improve their knowledge and skills related to prevention. Finally, 85 % of participants in the experimental group reported they will integrate the learning acquired in their daily work.

Apprenticeship

The average result on the six questions questionnaire of knowledge completed by participants (n=32) following their participation in workshops was 82.8 % \pm 17.3. Among all participants in the experimental group, 81.3 % could name two risks to health and safety related to their trade and 78.1% could define preventive behavior at work.

Behavior observed

Another variable in the evaluation of workshops was the behavior observed, as measured with the GACE (Therriault, 2006). Table 4 presents average percentages of adequate behavior observed among participants of control and experimental groups, at time 1 and at time 2. No statistical difference ($p > 0,05$) was found for study program at time 1 and at time 2 in experimental or control groups.

Insert table 4 here

Discussion

This study evaluated an intervention, in the form of workshops, designed and set up by occupational therapists for primary prevention of work-related injuries or illnesses in vocational students. Results of this study are positive on the three variables evaluated, namely 1) satisfaction with workshops; 2) apprenticeship; and 3) behavior observed.

Satisfaction with workshops

Results revealed that participants had overwhelmingly a great satisfaction with the various dimensions of workshops (e.g. relevance of contents to trade or quality of animation). Indeed, the weighted average of 3.4 ± 0.4 on the 4-level ordinal scale suits to a rating ranging from 'agree' to 'strongly agree'. A good satisfaction of participants with workshops is essential to preserve motivation to learn and to change behavior (Kirkpatrick & Kirkpatrick, 2007; Shin, Gwak, & Lee, 2015).

Apprenticeship

Apprenticeship is high for all participants. Indeed, an average of 82.8 ± 17.3 % on the knowledge questionnaire states the main concepts targeted by workshops were learned by participants. Acquisition of knowledge is a key determinant for behavior change (Kirkpatrick & Kirkpatrick, 2007), recognized both in literature on preventive behavior at work (Lecours & Therriault, 2017a) and in the general field of health promotion and prevention (Green & Kreuter, 2005). In doing so, it is suggested that workshops allowed students to acquire some antecedents of preventive behavior at work.

Behavior observed

For behavior observed, results demonstrate a significant positive effect of workshops, both at time 1 and at time 2. In fact, participants in the experimental group have nearly 15 % ($p < 0.05$) more adequate behavior than participants in the control group at time 1. This greater percentage of adequate behavior for participants in the experimental group remains at time 2 with a difference of a little over 12 % ($p < 0.05$). It is also interesting to note the percentage of adequate behavior is superior at time 2 than at time 1 for the experimental group, suggesting the effects of workshops hold in time. Also, this greater percentage of adequate behavior at time 2 suggest that students need a time to integrate learning and to transfer in their work activity, as it is reported in theoretical literature about workers' training (Kirkpatrick & Kirkpatrick, 2007). This greater percentage of adequate behavior at the end of vocational training (time 2) compared to the beginning (time 1) is also present among participants in the control group. This suggests that traditional teaching related to prevention also allows students to develop and integrate attributes of preventive behavior in their curriculum, despite the fact that it is generic. Results also show a moderate effect of workshops on behavior observed, both at time 1 ($r = 0.34$) and at time 2 ($r = 0.32$), which suggests this variable has a significant practical impact on the development of vocational students' preventive behavior at work. Finally, results suggest that participation in workshops designed by occupational therapists add a significant effect to traditional prevention training on vocational students' preventive behavior at work.

Practical implication for occupational therapists

Results of this study support the effective role of occupational therapists to promote the development of vocational students' preventive behavior at work. Additionally, promising results open the door to the development of the role of occupational therapists in vocational training centres. The collaboration between occupational therapists and elementary school teachers has been adressed several times (Barnes

& Turner, 2001; Benson, Szucs, & Mejasic, 2016; Kennedy, Kennedy, & Stewart, 2011; Kennedy & Stewart, 2012; Mistro, 1995; Truong & Hodgetts, 2017) and literature recognizes its value to support students' occupational functioning (Cahill, Holt, & Cassidy, 2008). It seems that occupational therapists can also intervene in support to teachers in vocational schools to help them develop students' preventive behavior. This project used a rigorous and systematic approach to design workshops that considered factors of effectiveness recognized in literature on workers' training. The project also promoted specificities of occupational therapists in activity analysis and paid attention to core values of the profession such as health, client-centered practice and collaboration. In-depth details provided about the design, set up and content of workshops allow to replicate and to reproduce a similar intervention with other vocational training programs and in other schools, strengthening the role of occupational therapists in primary prevention in health at work.

Limits

Although this study is innovative and pioneer about the practice of occupational therapists in primary prevention of work-related injuries and illnesses, some limits need to be discussed. The most important limit is the small sample size. Indeed, only two vocational training programs from the same school took part in the study, which limits the generalizability of the results to other schools or training programs. Also, it would have been interesting to measure preventive behavior before students' participation in workshops, which was not possible because of the curriculum grid of the study programs. Finally, a measure of students' knowledge about prevention taken before the first workshop may have also allowed to get a baseline value, enriching results coming from this study. To measure formally the efficacy of such workshops on students' development of preventive behavior at work, a randomized controlled trial should have to be conducted in a future research project.

Conclusion

This study exposed results of an effective approach to support the development of vocational students' preventive behavior at work. This is one of the first studies showing positive effects of an intervention conducted by occupational therapists in primary prevention of work-related injuries or illnesses. The study took place in an emerging working environment for occupational therapists, namely a vocational training center, and agreed with principles valued by the profession, such as the client-centered practice, the holistic vision and the evidence-based practice. This study promoted interdisciplinarity proposing collaboration with teachers and allowed to highlight the unique expertise of occupational therapists in

activity analysis, in adaptation of environment and in group education. With positive results found on students' satisfaction with workshops, apprenticeship and behavior observed, this study showed some efficacy of workshops designed and set up by occupational therapists on the development of vocational students' preventive behavior at work. A large-scale application of this intervention would allow to standardize the prevention training received by students across study programs in different schools, ensuring justice and equity, significant values for occupational therapists (Drolet & Désormeaux-Moreau, 2015). Promising results also point out the important place that occupational therapists can take in primary prevention in health at work and opens the door to further studies to better impose their role.

References

- Adam, K., Gibson, E., Lyle, A., & Strong, J. (2010). Development of roles for occupational therapists and physiotherapists in work related practice: An Australian perspective. *Work, 36*(3), 263. doi:10.3233/WOR-2010-1028
- Akselsson, R., Jacobsson, A., Bötjesson, M., Ek, Å., & Enander, A. (2012). Efficient and effective learning for safety from incidents. *Work, 41*, 3216-3222.
- Bade, S., & Eckert, J. (2008). Occupational therapists' expertise in work rehabilitation and ergonomics. *Work, 31*(1), 1-3.
- Balleux, A. (2006). Les étudiants en formation à l'enseignement professionnel au Québec : portrait d'un groupe particulier d'étudiants universitaires. *Canadian journal of higher education, 36*(1), 29-48.
- Barnes, K. J., & Turner, K. D. (2001). Team collaborative practices between teachers and occupational therapists. *Am J Occup Ther, 55*(1), 83.
- Benson, J. D., Szucs, K. A., & Mejasic, J. J. (2016). Teachers' perceptions of the role of occupational therapist in schools. *Journal of Occupational Therapy, Schools, & Early Intervention, 9*(3), 290-301. doi:10.1080/19411243.2016.1183158
- Berbaoui, A. (2015). *Les jeunes de 16-24 ans inscrits en formation professionnelle et les obstacles à leur participation à la formation*. Université de Sherbrooke, Sherbrooke.
- Cahill, S. M., Holt, C., & Cassidy, M. (2008). Collaborating with Teachers to Support Student Achievement Through Early Intervening Services. *Journal of Occupational Therapy, Schools, & Early Intervention, 1*(3-4), 263-270. doi:10.1080/19411240802589288
- CAOT. (2015). *CAOT position statement: occupational therapy and workplace health*. Ottawa: Canadian association of occupational therapists.
- Chatigny, Nadon-Vézina, L., Riel, J., Couture, V., & Hastey, P. (2012). *Analyse ergonomique de la santé et de la sécurité en centre de formation professionnelle*. Montreal: IRSST.
- Chatigny, C., & Desmarais, L. (2015). *L'intégration de la santé et de la sécurité dans la formation des élèves et des enseignants de la formation professionnelle*. Montreal: IRSST.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, New Jersey: Lawrence Erlbaum Associates.
- Cossette, R. (2013). Le comportement sécuritaire, un modèle qui pourrait rallier deux écoles de pensée. *Travail et Santé, 29*(1), 6-9.
- COT. (2008). *Health promotion in occupational therapy*. London, UK: College of Occupational Therapists.
- CSST. (2014). *Portrait des jeunes travailleurs de 24 ans ou moins - année 2013*. Québec.
- Deen, M., Gibson, L., & Strong, J. (2002). A survey of occupational therapy in Australian work practice. *Work, 19*(3), 219.
- Donica, D. K., Goins, A., & Wagner, L. (2013). Effectiveness of Handwriting Readiness Programs on Postural Control, Hand Control, and Letter and Number Formation in Head Start Classrooms. *Journal of Occupational Therapy, Schools, & Early Intervention, 6*(2), 81-93. doi:10.1080/19411243.2013.810938
- Drolet, M.-J., & Désormeaux-Moreau, M. (2015). The values of occupational therapy: Perceptions of occupational therapists in Quebec. *Scand J Occup Ther, 23*(4), 272-285.
- Dunberry, A., & Péchard, C. (2007). *L'évaluation de la formation dans l'entreprise : état de la question et perspectives*. Montreal: Université du Québec à Montreal.
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behav Res Methods, 41*(4), 1149-1160. doi:10.3758/BRM.41.4.1149
- Field, A. P., & Field, A. P. (2013). *Discovering statistics using IBM SPSS statistics : and sex and drugs and rock 'n' roll* (4th ed.). Los Angeles: SAGE.

- Fisher, T. F., Brodzinski-Andreae, B., & Zook, S. (2009). Effectiveness of work injury prevention education and safety training by an occupational therapist. *Br J Occup Ther*, 72(10), 450-457. doi:10.1177/030802260907201007
- Frigul, N., & Thébaud-Mony, A. (2010). *Où mène le Bac pro ? Enseignement professionnel et santé au travail des jeunes*. Retrieved from : <http://proxy.uqtr.ca/login.cgi?action=login&u=uqtr&db=harmattan&ezurl=http://www.harmathaque.com/ebook/9782296119888>
- Gervais, M., Massicotte, P., & Champoux, D. (2006). *Conditions de travail, de santé et de sécurité des travailleurs du Québec*. Montreal: IRSST
- Girard, S. A., Doyon, P., Gilbert, L., Legris, M., & Laliberté, D. (2006). Santé et sécurité du travail et formation professionnelle : Prochaine cible d'intérêt. *Pistes*, 8(2), On line.
- Gouvernement du Québec. (2010). *La formation professionnelle et technique au Québec : un aperçu*. Québec.
- Gouvernement du Québec. (2015). *Nombre d'inscriptions par programme de formation professionnelle, selon le type de diplôme recherché, le secteur de formation, le sexe, le type de fréquentation scolaire, la langue d'enseignement, la strate d'âge et le statut d'élève débutant, année scolaire 2013-2014*. Retrieved from <http://www.education.gouv.qc.ca/>.
- Green, L., & Kreuter, M. (2005). *Health program planning : an educational and ecological approach* (4th ed.). Boston, Mass.: McGraw-Hill.
- Guimont, S. (2013). *Programme en partenariat pour la prévention des troubles musculosquelettiques dans une pharmacie communautaire: étude exploratoire*. Université de Montreal, Montreal.
- Hämäläinen, P., Takala, J., & Saarela, K. L. (2006). Global estimates of occupational accidents. *Safety Sci*, 44(2), 137-156. doi:10.1016/j.ssci.2005.08.017
- Hamblin, J. (1974). *Evaluation and control of training*. London: McGraw-Hill.
- International Labour Organization. (2015). Safety and health at work. Retrieved from <http://www.ilo.org/global/topics/freedom-of-association-and-the-right-to-collective-bargaining/lang--en/index.htm>
- Jundt, J., & King, P. (1999). Work rehabilitation programs: a 1997 survey. *Work*, 12(2), 139-144.
- Kearns, P., & Miller, T. (1997). *Measuring the impact of training and development on the bottom line*. London: Pitman Publishing.
- Kennedy, S., Kennedy, S., & Stewart, H. (2011). Collaboration between occupational therapists and teachers: Definitions, implementation and efficacy. *Aust Occup Ther J*, 58(3), 209-214. doi:10.1111/j.1440-1630.2011.00934.x
- Kennedy, S., & Stewart, H. (2012). Collaboration with teachers: a survey of South Australian occupational therapists' perceptions and experiences. *Aust Occup Ther J*, 59(2), 147-155. doi:10.1111/j.1440-1630.2012.00999.x
- Kirkpatrick, D. L., & Kirkpatrick, J. D. (2007). *Implementing the four levels : a practical guide for effective evaluation of training programs*. San Francisco: Berrett-Koehler Publishers.
- Laberge, M., Maceachen, E., & Calvet, B. (2014). Why are occupational health and safety training approaches not effective? Understanding young worker learning processes using an ergonomic lens. *Safety Sci*, 68, 250-257. doi:10.1016/j.ssci.2014.04.012
- Lavoie, E. (2008). *Évaluation d'un programme d'ergothérapie participative pour la prévention de troubles musculosquelettiques auprès de travailleurs en usine: étude exploratoire*. Université de Montreal, Montreal.
- Lavoie, M., & Therriault, P. (2009). GACE-MAECES®: étude de fidélité inter-examineurs. *ErgOthérapies*, 35, 39-46.

- Lecours, A., Sauvageau, A., Cantin, N., & Therriault, P.-Y. (submitted). Mesure de l'efficacité d'ateliers de formation visant à développer un comportement préventif au travail chez les élèves en apprentissage d'un métier : une étude pilote. *Pistes*.
- Lecours, A., & Therriault, P.-Y. (2017a). Preventive behavior at work - A concept analysis. *Scand J Occup Ther*, 24(4), 1-10. doi:10.1080/11038128.2016.1242649
- Lecours, A., & Therriault, P.-Y. (2017b). Supporting vocational students' development of preventive behaviour at work: a phenomenological analysis of teachers' experiences *IJRVT*, 4(1), 20-46. doi:10.13152/IJRVT.4.1.2
- Ledoux, É., Laberge, L., Thuillier, C., Prud'homme, P., Veillette, S., Gaudreault, M., & Perron, M. (2008). *Étudier et travailler en région à 18 ans quels sont les risques de SST : une étude exploratoire*. Retrieved from: <http://bibvir2.uqac.ca/archivage/030032617.pdf>
- Ledoux, É., & Laberge, M. (2006). *Bilan et perspectives de recherche sur la SST des jeunes travailleurs*. Montreal: IRSST.
- Lee, S., & Pershing, J. A. (1999). Effective reaction evaluation in evaluating training programs. *Performance Improvement*, 38(8), 32-39.
- McCluskey, A., Lovarini, M., Bennett, S., McKenna, K., Tooth, L., & Hoffmann, T. (2005). What evidence exists for work-related injury prevention and management? Analysis of an occupational therapy evidence database (OTseeker). *Br J Occup Ther*, 68(10), 447-456.
- MELS & MESRST. (2012). *Indicateurs de l'éducation*. Retrieved from http://www.education.gouv.qc.ca/fileadmin/site_web/documents/PSG/statistiques_info_decisionnelle/Indicateurs_educ_2012_webP.pdf.
- Mistro, C. (1995). *Interdisciplinary communication between occupational therapists and regular education teachers*. Rush University, USA.
- Molenda, M., Pershing, J., & Reigeluth, C. (1996). Designing instructional systems. In R. Craig (Ed.), *The ASTD training and development handbook: a guide to human resource development* (4th ed.). New York: McGraw-Hill.
- Moreau, J. P., Angora, C., & Michel, X. (2013). *Gestion des enjeux de santé au travail dans l'enseignement professionnel*. Nantes: Académie de Nantes.
- Morgan, R. B., & Casper, W. J. (2000). Examining the factor structure of participant reactions to training: A multidimensional approach. *Hum Resource Dev*, 11(3), 301-317.
- Moscato, G., Pala, G., Boillat, M. A., Folletti, I., Gerth Van Wijk, R., Olgiate-des Gouttes, D., . . . Tarlo, S. M. (2011). EAACI position paper: prevention of work-related respiratory allergies among pre-apprentices or apprentices and young workers. *Allergy*, 66(9), 1164-1173. doi:10.1111/j.1398-9995.2011.02615.x
- Passmore, D. L., Odnoda, M., Paine, R., & Mohamed, D. A. (1991). *Epidemiology of work injuries among former participants in vocational education*. Paper presented at the 14th annual congress of the Northeast educational research association, Ellenville.
- Phillips, J. J. (1997). *Return on investment in training and performance improvement programs. A step-by-step manual for calculating the financial return*. Houston, USA: Gulf Publishing.
- Pisaniello, D. L., Stewart, S. K., Jahan, N., Pisaniello, S. L., Winefield, H., & Braunack-Mayer, A. (2013). The role of high schools in introductory occupational safety education – Teacher perspectives on effectiveness. *Safety Sci*, 55(2013), 53-61. doi:<http://dx.doi.org/10.1016/j.ssci.2012.12.011>
- Roy, M., Cadieux, J., Forter, L., & Leclerc, L. (2008). *Validation d'un outil d'autodiagnostic et d'un modèle de progression de la mesure en santé et sécurité du travail*. Montreal: IRSST.
- Scaffa, M. E., Van Slyke, N., & Brownson, C. A. (2008). Occupational therapy services in the promotion of health and the prevention of disease and disability. *Am J Occup Ther*, 62(6), 694-703.

- Shin, D.-P., Gwak, H.-S., & Lee, D.-E. (2015). Modeling the predictors of safety behavior in construction workers. *Int J Occup Saf Ergon*, 21(3), 298-311. doi:10.1080/10803548.2015.1085164
- Simard, M., & Marchand, A. (1994). The behaviour of first-line supervisors in accident prevention and effectiveness in occupational safety. *Safety Sci*, 17(3), 169-185. doi:10.1016/0925-7535(94)90010-8
- Snodgrass, J. (2011). Effective occupational therapy interventions in the rehabilitation of individuals with work-related low back injuries and illnesses: a systematic review. *Am J Occup Ther*, 65(1), 37.
- Therriault, P.-Y. (2006). *Méthode d'analyse ergonomique des capacités d'un travailleur et des exigences d'une situation de travail (MAECES®)*. Montreal, Canada: EAQ Publications.
- Truong, V., & Hodgetts, S. (2017). An exploration of teacher perceptions toward occupational therapy and occupational therapy practices: A scoping review. *Journal of Occupational Therapy, Schools, & Early Intervention*, 10(2), 121-136. doi:10.1080/19411243.2017.1304840
- Tucker, P., Vanderloo, L. M., Irwin, J. D., Mandich, A. D., & Bossers, A. M. (2014). Exploring the nexus between health promotion and occupational therapy: Synergies and similarities. *Can J Occup Ther*, 81(3), 183-193. doi:10.1177/0008417414533300
- Zierold, K. M., & Anderson, H. A. (2006). Severe injury and the need for improved safety training among working teens. *Am J Health Behav*, 30(5), 525.

Figure 1

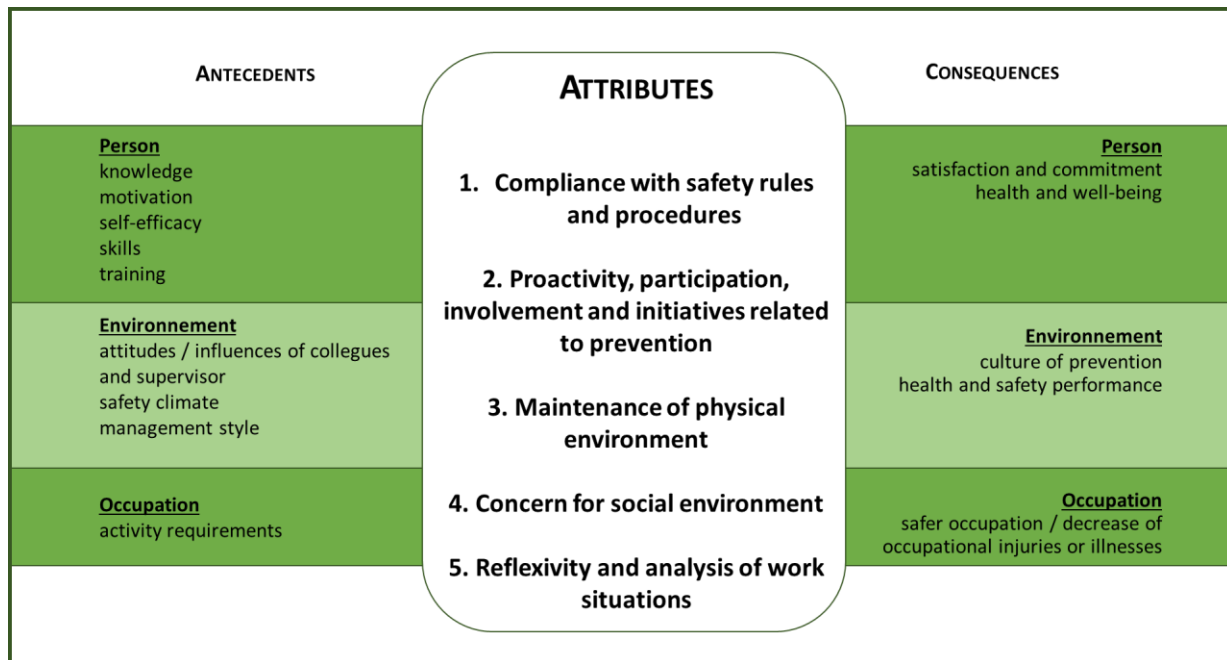


Figure 1. Characteristics of preventive behavior at work (adapted from Lecours&Therriault, 2017a)

Figure 2

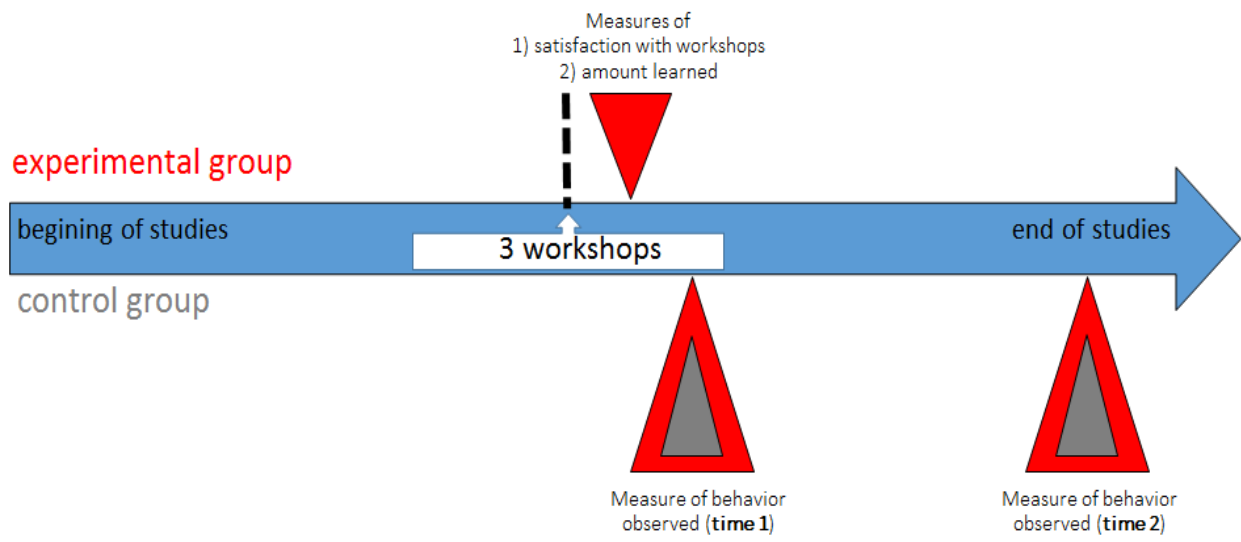


Figure 2. Measurement times of each variable for experimental and control groups.

Table 1

Table 1. Ten-step process used to design workshops (Kirkpatrick & Kirkpatrick, 2007)

1	Determine needs of participants
2	Define competencies to acquire
3	Determine content
4	Select participants
5	Determine the optimal time
6	Select the required equipment and facilities
7	Select a qualified trainer
8	Select the adequate audiovisual media
9	Coordinate workshops
10	Evaluate workshops

Table 2

Table 2. Detailed description of workshops

Title of workshop serie : becoming an actor of my health and safety at work		
Characteristics of preventive behavior at work to develop	Content specific to trade	Learning modalities
Competencies targeted by workshop 1: explain how does work my body; identify symptoms of work-related injuries or illnesses and; identify risk factors related to my trade		
<p><i>To acquire these competencies, students must develop antecedents of preventive behavior at work:</i></p> <ul style="list-style-type: none"> • Knowledge • Motivation • Skills • Self-efficacy • Activity requirements • Attitudes of all towards prevention 	<ul style="list-style-type: none"> • Work-related health and safety statistics • Knowledge of anatomy / physiology • Concepts in ergonomics • Symptoms of work-related injuries or illnesses • Work-related health and safety risk factors 	<ul style="list-style-type: none"> • Lectures • Working in subgroups • Individual self-assessment / reflection questionnaire • Case story • Discussion and exchange in large groups
Competencies targeted by workshop 2 : analyze a working situation; detect health or safety risks; choose a preventive action; set up a preventive action; and evaluate the effectiveness		
<p><i>To acquire these competencies, students must develop attributes of preventive behavior at work:</i></p> <ul style="list-style-type: none"> • Compliance with rules and procedures • Proactivity, participation, involvement and initiatives related to prevention • Maintenance of physical environment • Concern for social environment • Reflexivity and analysis of work situations 	<ul style="list-style-type: none"> • Presentation of each of the attributes and application examples specific to the trade 	<ul style="list-style-type: none"> • Risk analysis in a work situation • Problems solving • Testing tools and strategies to reduce risks • Using photos and videos • Presentation of pre / post work situations • Workshop simulations • Team observation and reflection
Competency targeted by workshop 3 : developing preventive behavior at work		
<p><i>To acquire this competency, students must develop the antecedents and attributes of preventive behavior at work. They must also be sensitized to its consequences:</i></p>	<ul style="list-style-type: none"> • Review of the attributes of preventive behavior at work • Alternatives to be preferred when strategies learned do 	<ul style="list-style-type: none"> • Reminder of important points by lecture • Integration of learning in work situation

<ul style="list-style-type: none"> • Satisfaction and commitment • Health and well-being • Decrease in work-related injuries or illnesses • Culture of prevention 	<p>not work in reality - notions of compromise</p> <ul style="list-style-type: none"> • Presentation of the consequences of preventive behavior at work • Prevention in out-of-work activities 	<ul style="list-style-type: none"> • Testimony on the consequences of work-related injuries or illnesses • Presentation of some prevention tools (e.g. warm-up exercises related to trade)
---	--	--

Table 3

Table 3. Demographic characteristics of participants

Characteristic	Control group (n=38)	Experimental group (n=36)	p value
Gender			1.0 ^a
- Women	28	27	
- Men	10	9	
Age mean (SD)	23.1 (7.5)	22.9 (7.3)	0.91 ^b
High school diploma			0.60 ^a
- yes	23	26	
- no	12	9	
Part-time job			0.17 ^a
- yes	19	12	
- no	19	24	

Note. ^a Chi-square, ^b independent T-test

Table 4

Table 4. Average percentages and standard deviations of adequate behavior for control and experimental groups, at time 1 and time 2.

	Control group	Experimental group	Test	p value	Effect size (r)
Average percentages of adequate behavior (SD) TIME 1	n*=26 18.7 % (20.2)	n*=44 33.6 % (20.6)	U = 339	0.004	0.34
Average percentages of adequate behavior (SD) TIME 2	n*=22 29.2 % (18.3)	n*=22 41.6 % (19.8)	U=153	0.04	0.32

Note. n* = number of observations. One participant may have been observed more than once if several behavior were performed.